Steps Towards the Remote Tower Center

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Virtual Control Tower, Remote Tower Center, Video Panorama, Work Organization

Introduction

Airport ground traffic control relies on visual surveillance by air traffic controllers from an elevated control tower. Provision of landing or take-off clearances to pilots upon pilot's clearance request via radio communication is furthermore based on more or less standardized equipment and procedures utilizing a number of information sources such as flight control strips, approach radar and weather display. At large airports advanced surface movement guidance and control systems (ASMGCS) support controllers with electronic surveillance systems such as surface movement radar (SME). Nevertheless work and task analyses indicate the continued importance of the visual information for current controller's work procedures (Tavanti, 2006) (Pinska, 2006) (Fürstenau & Schulz-Rueckert, 2010).

The present airport control tower work environment has evolved into a safe and reliable system during the first century of air transportation. However, given the present day technological advances, it probably no longer is the most efficient and economic way to satisfy the demand for providing cost efficient controlled airspace. This situation is especially relevant for small airports which are increasingly used by low cost carriers.

For approximately the last ten years research has begun to examine alternatives to the control tower based airport traffic management (Fürstenau et.al, 2008) (Schmidt et.al., 2009)(Fürstenau & Schulz-Rueckert, 2010). One reason for this examination is the emergence of high resolution video and visualization technologies, image compression techniques, broad bandwidth data communication, and high power computing for low cost. This development suggests investigation of the possibilities for a new control tower work environment without the need for a costly physical tower building. This new design concept could use a digital video based reconstruction of out-the-window view. The proposed Remote Tower Center (RTC) is expected to significantly increase efficiency by providing controlled airspace to several small airports (usually without any electronic surveillance) from a central location by means of an appropriate new work environment. An experimental testbed as well as simulation facilities have been set up for this research.

The Remote Tower session includes contributions from the federally funded joint project ViCTOR (Virtual Control Tower Research Studies) lead by DFS, and from the DLR project RAiCe (Remote Airport Traffic Control Center), addressing research in new concepts of operation, work system analysis and design, communication and team work, as well as visualization aspects.

Literature

Fuerstenau, N. & Schulz-Rueckert, D. (2010). *Virtual Tower*. Special Session at: 11th IFAC Symposium: *Analysis, Design, and Evaluation of Human-Machine-Systems, Valenciennes*. Abstracts available at: http://www.univ-valenciennes.fr/ congres/IFACHMS2010/. t.b. published at: http://www.ifac-papersonline.net/

Fürstenau, N., Schmidt, M., Rudolph, M., Möhlenbrink, C. & Halle, W. (2008). *Augmented vision videopanorama system for remote airport tower operation*. In: I. Grant (Ed.) Proc. ICAS , 26th Int. Congress of the Aeronautical Sciences., Anchorage, ISBN 0-9533991-9-2

Pinska, E. (2006). *An Investigation of the Head-up Time at Tower and Ground Control Positions.* Proc. 5th Eurocontrol Innovative Research Workshop, Bretigny 81-86

Schmidt, M. Rudolph, M., Papenfuß, A., Friedrich, M., Möhlenbrink, C. Kaltenhäuser, S. Fürstenau, N. (2009*). Remote airport traffic control center with augmented vision video panorama.* in: Proc. DASC '09 IEEE/AIAA, 28th Digital Avionics Systems Conference.Orlando (2009) ISBN 978-1-4244-4078-8, 4.E.2-1 – 4.E.2-15

Tavanti, M. (2006). *Control Tower Operations: A literature review of task analysis studies.* Eurocontrol Experimental Center, EEC Report 2006-06

Outline of the individual talks

Leitner, R. , Oehme, A. & Schulz-Rückert, D.

Planning Multi-Airport Traffic Control – Requirements and Design Implications

König, C. &Theuerling, H.

Experimental study of basic visualization aspects for future air traffic control workplaces

Ellis, S. R. , Fürstenau, N. & Mittendorf, M.

Determination of Framerate Requirements for Videopanorama-based Virtual Towers using Visual Discrimination of Deceleration during Simulated Aircraft Landing: alternative analysis

Papenfuss, A. & Möhlenbrink, C.

The challenges and opportunities of team work in remote tower center operations

Wittbrodt, N. & Thüring, M.

The Effect of 'Party Line' Communication on Pilots' Situation Awareness in a Multiple-Airport Scenario

Lange, M., Möhlenbrink, C., Papenfuß, A.

Analysis of controller - pilot communication for future concepts of remote airport control